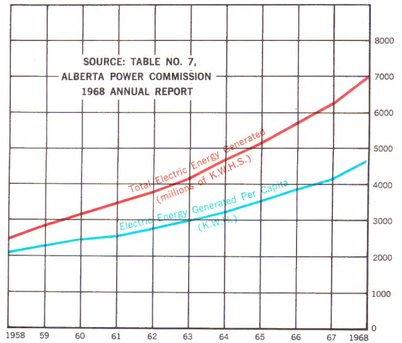
PURPOSES FOR DEVELOPMENT

MEETING THE GROWING POWER NEEDS OF ALBERTA'S CITIZENS

The dynamic growth experienced by the provincial economy is reflected by the Province's growing power needs. Not only has the total output increased tremendously (186% over ten years) but per capita consumption has more than doubled in the same period. Increasing per capita use coupled with a growing population are indicative of the large amounts of energy that must be provided by the electric energy industry.

See Chart of total and per capita use for the years 1958 to 1968.

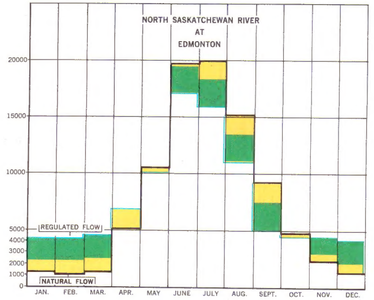
The Bighorn Storage & Power Development will provide an important addition to Alberta's capacity for electric power production, and will play a vital role maintaining the sustained economic growth being experienced by the Province.



WATER STORAGE FOR FLOW REGULATION

The over one million acre-feet of storage created by the Bighorn Reservoir will provide additional regulation of river flow on the North Saskatchewan River. Water will be stored during periods of high flows, for release later during periods of lower flow. This flow regulation results in a better distribution of water over the total year.

The sketch below shows the annual hydrograph of the North Saskatchewan River at Edmonton. The black line indicates the average monthly total flows before regulation. The blue line indicates the probable average monthly flows after regulation has been provided. The yellow portion of the hydrograph indicates the percentage of the regulation supplied by the Brazeau Reservoir. The green portion of the hydrograph indicates the percentage of the regulation which will be supplied by the Bighorn Reservoir. As can be seen, regulation of the river results in considerably higher average low flows. By maintaining higher average low flows, cities, towns and industries are assured of adequate water supplies at all times. Also, pollution abatement is more effective.



P.R.I.M.E. (Prairie Rivers Improvement Management and Evaluation)

Although Alberta is blessed with abundant surface water supplies, the distribution of this water is not ideal. Almost ninety percent of surface flows are concentrated in the northern half of the Province, while population and industry are concentrated in the southern half. The Bighorn Reservoir is complementary to P.R.I.M.E., the concept that northward flowing rivers will have excess flows diverted southward to meet growing water needs.

If diversion of water from the North Saskatchewan River is required, the storage created by the Bighorn Dam will reduce storage requirements of any downstream diversion reservoir. The sketch below indicates diversion sites and routes currently being investigated by the Provincial Water Resources Division, under the P.R.I.M.E. program. The Bighorn Reservoir would provide both storage and flow regulation for this proposed diversion of water from the North Saskatchewan River southward to the Bow River.

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THE BIGHORN DAM

DEVELOPING ALBERTA'S WATER RESOURCES

ALBERTA

CALGARY POWER

BACKGROUND

It takes a mighty effort to harness the forces of a wild and unruly river that finds its source in a thousand unpredictable rivulets cascading from rugged mountain peaks. But Calgary Power Ltd. and the Government of Alberta have taken on that chore. The river is the inconsistent North Saskatchewan: the project the Bighorn power complex. For decades this river has defied the attempts of man to control its fluctuating downstream flow. For years it has been eyed as a source for generating electrical power, but has thwarted its potential captors with a tricky foundation problem. But by 1972 — perhaps earlier — the plain cussedness of the North Saskatchewan will be conquered. The partnership between the government and Calgary Power drew its birth from two basic needs; control of the river, and the need for more peak power to meet the province's booming electrical requirements. The government of Alberta was looking for a means to control the North Saskatchewan. They sought ways of equalizing the flow of the river downstream — particularly through Edmonton — between the heavy flows during spring run-off and a limited flow during the winter. In addition, government officials were seeking a way to divert some of the abundant northern waters to the south. The Bighorn project provided the solution to the problems of both the government and Calgary Power.

Located some 80 miles west of Rocky Mountain House, the Bighorn becomes a key to future equal distribution of Alberta's water resources between the northern and southern sectors of the province. The dam will make economically feasible the construction of engineering works needed to divert some of the North Saskatchewan River water into the Red Deer River system, making additional water available to the south-east part of the province.

The reservoir will cover 13,700 acres over some 20 miles, and clearing for this vast storage area was done by the government. The area was cleared of all brush and timber up to the high-water line. When flooded, the reservoir will contain 1,165,000 acre-feet of usable storage, with 120 feet of drawdown. The maximum depth of the water will be 295 feet at the dam face. The earth fill dam will be 300 feet high and 1,400 feet long. Two 54,000 kilowatt generators will be installed in the powerhouse. This will add to Calgary Power's peaking power facilities ('peaking power' refers to the maximum energy required by consumers at a given time), and will add some 400,000,000 kilowatt hours of energy for use on the Company's system.

The Bighorn site was first investigated in 1953, however, soil tests at that time revealed problems that could not be overcome economically with the technical knowledge of the day. A 190-foot gorge in the river bed is filled with pervious gravel and sealing the base would have been impractical then.

However, new techniques have been developed enabling Calgary Power and its contractors to seal the gorge with a concrete curtain wall. Power from the dam will be fed into the Calgary Power grid, and will serve Albertans in a service area that demands two-thirds of the province's electricity output.

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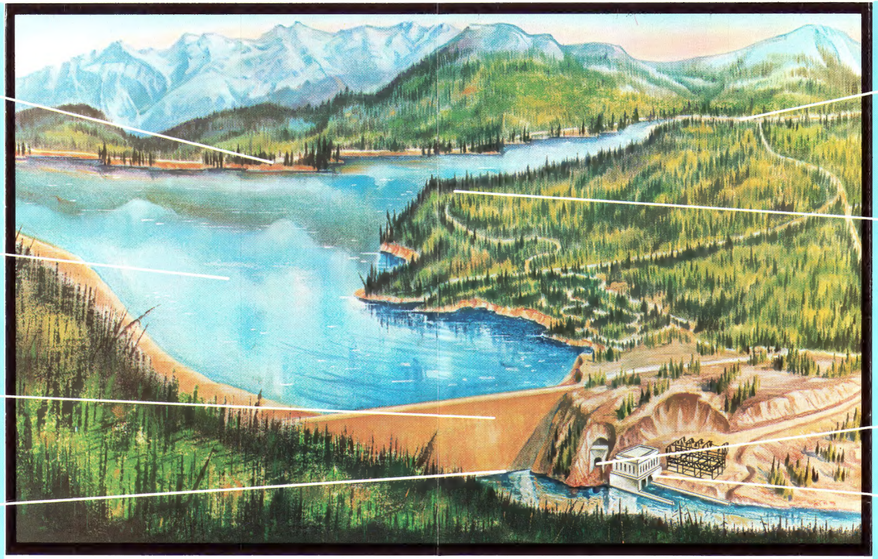
DAVID THOMPSON HIGHWAY — The David Thompson Highway is the mid-province link between Alberta and British Columbia. The highway travels along the shores of the reservoir and provides the traveller with an expansive view of the mammoth project. The highway runs west from Rocky Mountain House, Alberta.

RESERVOIR—The completed reservoir will be 20 miles long and will cover an area of 13,700 acres. It will provide storage for 1,165,000 acre feet of water. The Government of Alberta cleared the reservoir area of brush and timber prior to flooding, with a view towards establishing recreation areas around the lake.

MAIN DAM—The accompanying photographs show the make-up of the Main Dam. The dam will be 1,400 feet long and 300 feet high. It will require 3,800,000 cubic yards of material. When completed the dam will block the progress of the North Saskatchewan River to form a 20-mile long lake.

CURTAIN WALL—Buried deep under the dam lies an engineering feat that would have been impossible just 10 years ago. The river bed is composed of pervious gravel, and without sealing this gravel, water would seep under the dam, weakening the foundation. A special bentonite Curtain Wall has been built downward some 200 feet from the base of the dam, and successfully seals the bedrock from the flow of water.



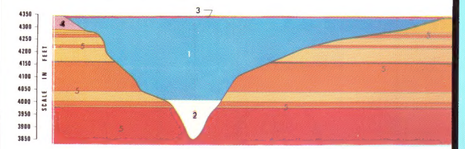
SPILLWAY—The spillway is located on a "finger" of the reservoir, in a northerly direction from the main dam. Water released over the spillway will escape down a separate gorge, to join the main river downstream from the dam. The spillway is designed to handle excess water caused by heavy run-off.

LOOK-OUT—A special observation point has been established where tourists can view the reservoir, dam and power house. The site, equipped with picnic facilities, is located between the main dam and the spillway, and can be reached by following directional signs on the David Thompson Highway.

TUNNELS—A network of tunnels comprised the first major construction project in the Bighorn building program. The river was diverted around the dam site by tunnel during construction of the dam, and portions of these tunnels — some 1,500 feet long and 22 feet in diameter — form the power tunnel. Water will roar down the power tunnel or penstocks to the waiting generators in the Power House.

POWER HOUSE—Two 54,000 kilowatt generators will be housed in the Power House and will feed power to the Calgary Power grid. The generators will be driven by the waters of the North Saskatchewan River as it passes through the power tunnels from the sprawling reservoir.

DAM PROFILE, FACING DOWNSTREAM



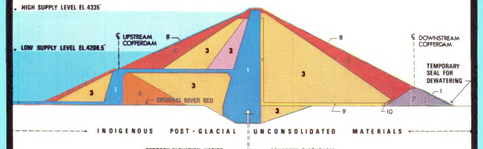
LEGEND
1 IMPERVIOUS CORE
2 CONCRETE CUT-OFF WALL
3 PERVIOUS MATERIAL
4 OVERBURDEN
5 BEDROCK

The Bighorn Power and Storage Development is a joint project of the Government of Alberta and Calgary Power Ltd. Construction began in the summer of 1969 and the giant project will begin generating power in the autumn of 1972.

The impressive complex, completed, will provide Albertans with additional electric power and offers a full range of multiple uses in the province's water management program.

The dam is located 80 miles west of Rocky Mountain House on the David Thompson Highway, and is expected to become a major tourist attraction as more travellers discover the rugged attractiveness of the area and as recreation sites are completed.

DAM SECTION



LEGEND
1 IMPERVIOUS CORE
2 IMPERVIOUS
3 COMMON FILL
4 SELECT PERVIOUS SHELL
5 PERVIOUS SHELL
6 COARSE COMMON FILL
7 ROCK FILL
8 RIPRAP
9 DRAINS (CURTAIN, VERT.-FINGER, HORIZ.)
10 GRAVEL FILTER

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